KOKAI PATENT APPLICATION NO. SHO 58-51144

LIGHT-SCATTERING REFLECTIVE DEPOSITION SHEET

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LIGHT-SCATTERING REFLECTIVE DEPOSITION SHEET

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[*Attached amendments have been incorporated into the text of this translation*]

Specification

1. Title of the invention

Light-scattering reflective deposition sheet

2. Claims of the invention

(1) A light-scattering reflective deposition sheet characterized by the fact that a light-scattering reflective film having a fine dual-textured surface is formed on the surface of a base material when a hot-melt resin mixed with a fine particle pigment, silicon oxide, metal oxide, or alkali earth salt is laminated on the surface of a base material comprising a plastic film or sheet using the extrusion lamination method via a chill roll having a fine pattern on the surface; then, a light-scattering reflective deposition film is formed on the aforementioned light-scattering reflective layer so that a reflective layer having a fine dual-textured surface is produced.

(2) A light-scattering reflective deposition sheet characterized by the fact that a light-scattering reflective film having a fine dual-textured surface is formed on the surface of a base material when a hot-melt resin is mixed with a fine particle pigment, silicon oxide, metal oxide, or an alkali earth salt and laminated onto the surface of the base material, which comprises a plastic sheet stretched ahead of time, using extrusion lamination via a chill roll having a fine pattern on the surface; then, a light-scattering reflective deposition film is formed on the aforementioned light-scattering reflective layer so that a reflective layer having a fine dual-textured surface is

produced.

(3) The light-scattering reflective deposition sheet described in Claim 1 or Claim 2 in which paper is applied to the non-deposited surface of the aforementioned light-scattering reflective deposition sheet.

3. Detailed description of the invention

The present invention pertains to a method for forming of a light-scattering reflective film (matte layer) on one surface of a base material such as a plastic film or sheet and the invention further pertains to a method for continuous forming of a light-scattering reflective film (matte layer) having a fine dual-textured surface on the aforementioned base material by forming on the surface of a chill roll used for cooling and solidifying a hot-melt resin containing fine particles of pigment, silicon oxide, metal oxide, or alkali earth salt applied to the surface of the base material using the extrusion lamination method.

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Paper where a metal foil such as aluminum foil is laminated on the surface of a transparent plastic film and the film is applied to the surface of a sheet of paper are used for decoration and packaging materials. In this case, excellent printability can be achieved and moisture resistance, water resistance, and air tightness are superior, but the surface has a mirror finish and the incident light is reflected in a specific direction depending on the angle of incidence and the light is reflected toward the customer and the appearance becomes tacky, and furthermore, scratches based on friction are likely to be formed, in which case, the sheet is not suitable to be used as a packaging material.

The purpose of the present invention is to produce a light-scattering reflective deposition sheet with an absence of the above-mentioned problem while retaining gas, moisture, and heat resistance properties of packaging materials with conventional metal foils applied.

In the past, in order to produce a light-scattering reflective film on the surface of a base

material, a method in which a resin with fine particles mixed in it is dissolved in a solvent and coated using a method such as gravure coating or silk screen printing, and drying is done under heat to form a light-scattering reflective film having a fine textured surface.

In the above-mentioned conventional method, the resin solution is likely to be adsorbed on the plate or screen and clogging is likely to occur, and furthermore, solvent remains in the product and causes pollution at the time of secondary fabrication processes or at the time of use of the product, and furthermore, production is not possible with a resin that is not soluble in a solvent. In addition, the concentration of the resin dissolved in the solvent increases with the passage of time as a result of evaporation of the solvent; thus, control of the concentration of the solvent is difficult and inconvenient. In addition to the above-mentioned methods, mechanical and physical methods such as sandblasting and embossing methods are conceivable, but the selection of film materials is limited and a certain film thickness is required, as well. Furthermore, a chemical method such as etching is conceivable, but cleaning and drying after processing are inconvenient.

Furthermore, in general, stiffness of synthetic resin film is poor, and formation of wrinkles occurs at the time of tearing.

In addition, in order to improve the physical properties of synthetic resin films, drawing is commonly done, and when biaxial drawing is done in an attempt to increase the stiffness, transparency, barrier property, and heat shrink property, etc., and tearing becomes even more difficult, and when possible, the tear direction is not constant since biaxial drawing is done. Especially when a synthetic resin film having high mechanical stability and dimensional stability, such as a polyester or polyolefin, is used, a cutter is required and tearing by hand is not possible.

The present invention is to eliminate the above-mentioned existing problems and the present invention is a light-scattering reflective deposition sheet characterized by the fact that a light-scattering reflective film having a fine dual-textured surface is formed on a base material when a hot-melt resin dispersed with a fine particle pigment, silicon oxide, metal oxide, or alkali

earth salt is laminated on the surface of a base material comprising a plastic film or sheet using the extrusion lamination method via a chill roll having fine pattern on the surface; then, a light-scattering reflective deposition film is formed on the aforementioned light-scattering reflective film layer to produce a fine dual-textured reflective surface.

Furthermore, the present invention is a light-scattering reflective deposition sheet characterized by the fact that a light-scattering reflective layer having a fine dual-textured surface is formed on the surface of a base material when a hot-melt resin dispersed with fine particles of pigment, silicon oxide, metal oxide, or alkali earth salt is laminated on the surface of the base material which comprises a plastic sheet, that has been stretched ahead of time, using extrusion lamination method via a chill roll having a fine pattern on the surface; then, a light-scattering reflective deposition film is formed on the aforementioned light-scattering reflective layer to form a fine dual-textured reflective surface.

And furthermore, the present invention is a light-scattering reflective deposition sheet described in 1 or 2 above in which paper is applied to the non-deposited surface of the aforementioned light-scattering reflective deposition sheet.

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The present invention is explained in further detail with the working examples and drawings below.

In Fig. 1, A is a base material made of a plastic film or sheet such as polypropylene and polyester, and the film thickness is in the range of 10 to 70 μm and is uniform.

Fig. 2 is an embodiment of the present invention, and in the figure, 1 is the hopper and a hot-melt resin such as polyolefin, polyvinyl chloride and polyester pellets mixed with fine particles of pigment, silicon oxide, metal oxide, and alkali earth salt are fed through feeder 1a.

2 is the extruder and the aforementioned resin pellets are made molten and fed to T-die 3 below. A hot-melt curtain of material 4 is extruded from slit 3a of the above-mentioned T-die 3 to form a film with a constant thickness and constant width.

Meanwhile, base material A shown in the aforementioned Fig. 1 is pulled from supply drum 5 and is taken-up by take-up drum 7 at a constant rate via pressure roll 6. Furthermore, chill roll 8 having a fine rough surface is provided so that the pattern is transferred to the surface of the base material strip A transported under a specific pressure.

And furthermore, when the aforementioned hot-melt curtain-like material 4 is uniformly poured into the space between the surface of base material A, that travels over the surface of pressure roll 6 in the direction indicated by the arrow, and the aforementioned chill roll 8, a super-fine rough surface based on fine particles E mixed with the aforementioned hot-melt resin is chilled and solidified to form a pattern according to the pattern on the above-mentioned chill roll and a textured reflective sheet 9 having fine dual-textured surface B can be produced. When a metal such as aluminum is deposited on the above-mentioned fine dual-textured surface B using a method such as deposition, a metal deposition film having a uniform thickness (400 to 2000 Å) such as the one shown in Fig. 3 can be produced, and sheet product 9 of the present invention having a light-scattering reflective layer C formed on the rough reflective layer based on fine dual-textured surface B can be produced.

The aforementioned sheet product 9 has a beautiful appearance without glitter and is unique to the present invention based on the fine dual-textured surface that is not observed in products of the prior art, and provides a product suitable for decorative packaging, discharge recording media, etc.

In the second working example of the present invention, drawing is done in both directions for sheet A having the aforementioned fine dual-textured surface B using a known method such as tentering, metal deposition is done on fine dual-textured surface B; thus, a thin nonuniform reflective sheet with adequate stiffness can be produced.

Furthermore, in the third working example of the present invention, backing paper D is applied to the non-deposited surface of the aforementioned light-scattering reflective deposition sheet with an adhesive or by the hot-melt bonding or lamination method; thus, a nonuniform

reflective sheet that can be easily torn can be produced.

Furthermore, in order to use the present invention as a discharge recording medium, tinting of plastic sheet A or backing paper D is done or a color layer is placed between sheet A and paper D. Furthermore, when a fine, rough surface having rounded knurls is formed on chill roll 8 and essentially round fine particles E such as silicon oxide or alkali earth salt are used, a light-scattering reflective deposition film C with a fine dual-textured surface with rounded peaks such as the one shown in Fig. 4(b) can be produced.

As described above, in the first working example of the present invention, formation of a light-scattering reflective layer having a fine dual-textured surface is achieved on the surface of the base material when a hot-melt resin mixed with fine particles of pigment, silicon oxide, metal oxide, and alkali earth salt is laminated onto the surface of a base material comprising a plastic sheet, that has been stretched ahead of time, using extrusion lamination via a chill roll having a fine pattern on the surface; then, a light-scattering reflective deposition film is formed on the aforementioned light-scattering reflective layer; thus, clogging of the chill roll is absent since a solvent is not used.

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According to the present invention, a fine, rough surface is used for the chill roll in forming the plastic sheet and a solvent is not used; thus, pollution based on the solvent is absent. Furthermore, light scattering and a reflective fine dual-textured surface based on hot-melt resin can be produced in the present invention; thus, resins insoluble in solvents may be used, and furthermore, control of the molten resin concentration is not required, and control of viscosity of the hot-melt resin, temperature, and rotation speed of the chill roll can be automated under optimum conditions by a computer, and mass production of a uniform product at low cost is possible. Furthermore, in comparison to those materials produced by mechanical methods such as sandblasting and embossing, selection of the material and thickness of the film can be improved, and inexpensive films can be used, and the method is cost effective. Furthermore, in

comparison to chemical methods such as etching, the energy required for cleaning and drying is eliminated, and water and chemicals are not used; thus, the method is cost effective, and energy and materials savings are achieved.

Furthermore, in the second working example, a light-scattering reflective film layer having a fine dual-textured surface is achieved for the surface of a base material when a hot-melt resin dispersed with fine particles of pigment, silicon oxide, metal oxide, or alkali earth salt is laminated onto the surface of a base material comprising a plastic sheet, that has been stretched ahead of time, using extrusion lamination via a chill roll having a fine pattern on the surface; then, a light-scattering reflective deposition film having a fine dual-textured surface is formed on the aforementioned light-scattering reflective layer; thus, in addition to the above-mentioned effect, properties of the synthetic resin film can be improved, stiffness of the overall sheet can be increased, transparency can be increased, the barrier property can be improved, thermal shrinkage can be improved, but tearing by hand is not possible since drawing is done in both directions and a cutter is required for cutting.

Furthermore, in the third working example of the present invention, a paper is applied to the non-deposited surface of the aforementioned light-scattering reflective deposition sheet; thus, in addition to the above-mentioned features, the stiffness of overall sheet is increased and wrinkling is absent at the time of tearing at a necessary place and tearing is easy in a specific direction.

4. Brief description of figures

The figures show working examples of the present invention. Fig. 1 is an enlarged cross-section view of the base material, Fig. 2 is a structural diagram of an embodiment of the device of the present invention, Fig. 3 is an enlarged cross-section view of a working example of the product of the present invention, Fig. 4(a) is an enlarged cross-section view of Fig. 3, and Fig. 4(b) is an enlarged cross-section view of a modified example.

Explanation of codes

A: Base material

B: Fine dual-textured surface

C: Light-scattering reflective deposition film

D: Backing paper

E: Super fine particles

1: Hopper

1a: Pellet feeder

2: Extruder

3: T-die

3a: Slit

4: Curtain of hot-melt material

5: Supply drum

6: Pressure roll

7: Take-up drum

8: Chill roll

9: Nonuniform reflective sheet product

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Fig. 1

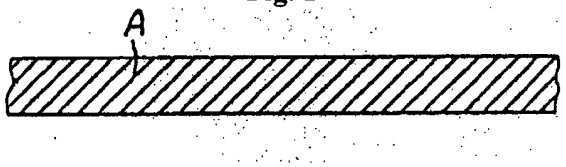


Fig. 2

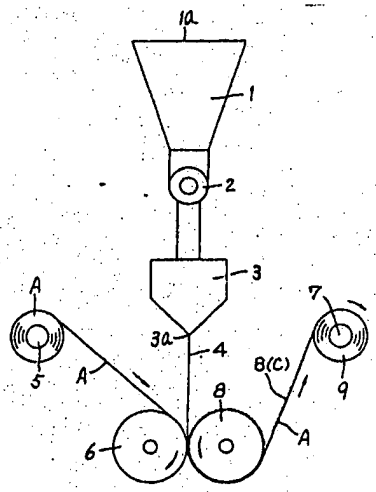


Fig. 3

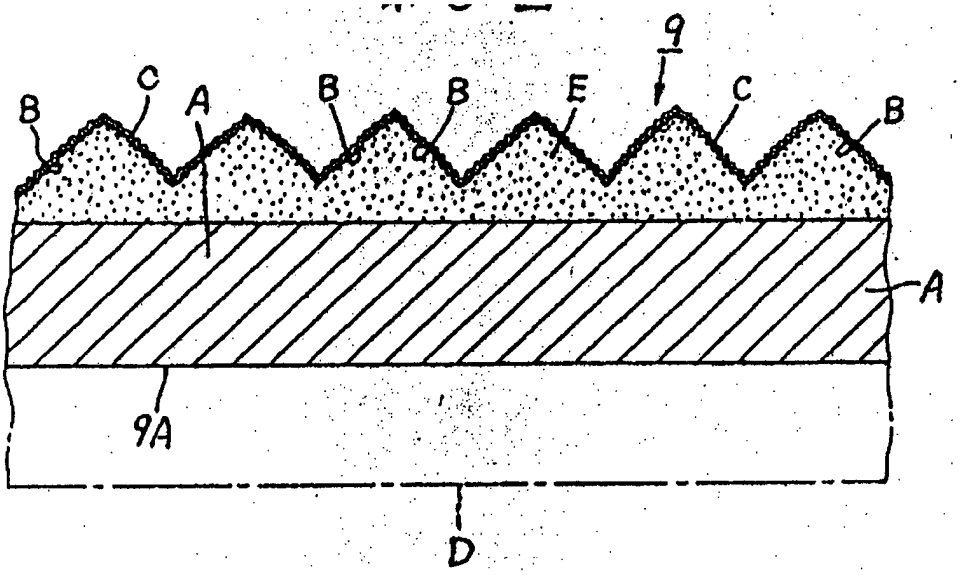


Fig. 4(a)

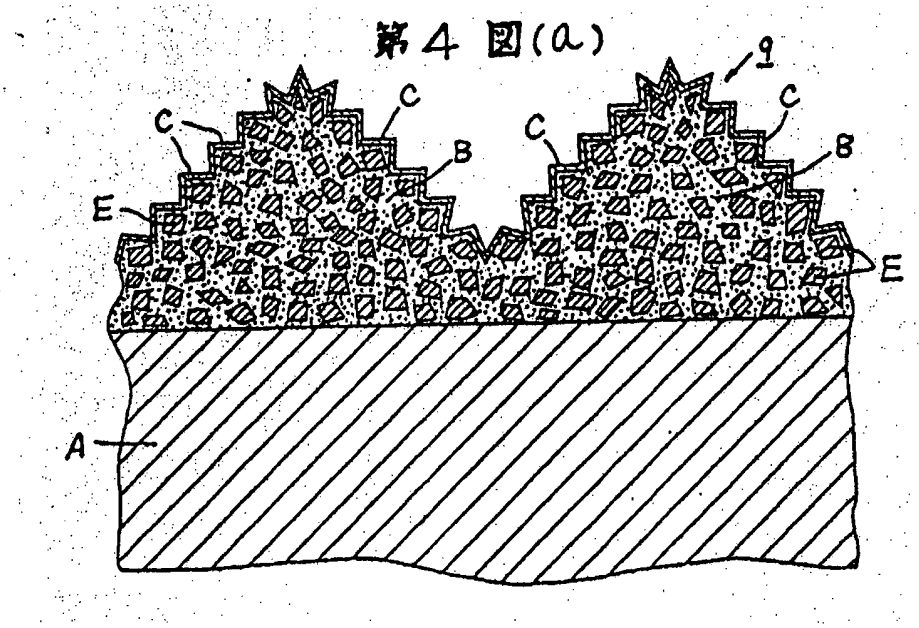
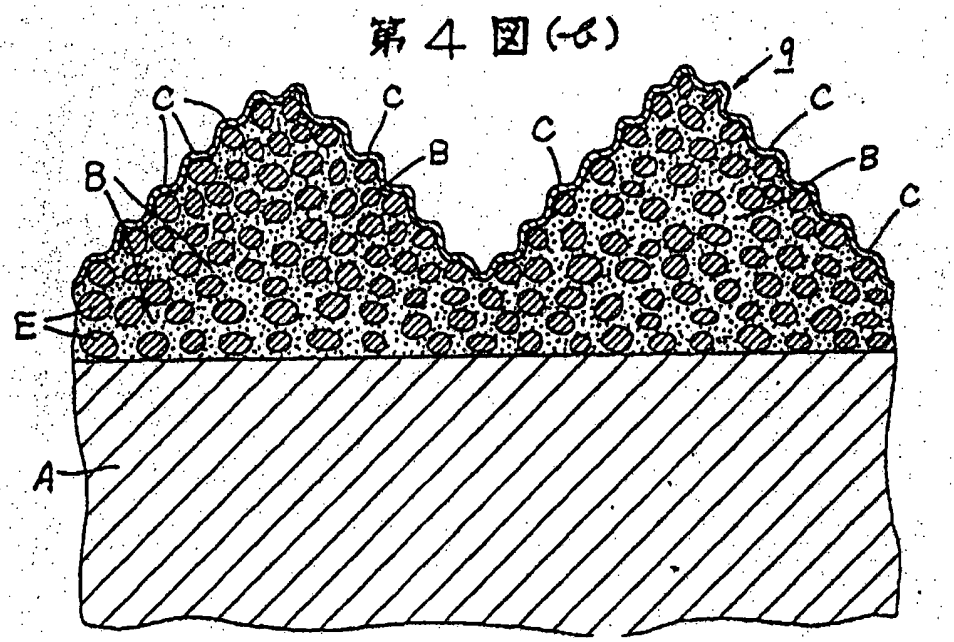


Fig. 4(b)



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Amendments requested: June 3, Sho 57

[Attached amendments have been incorporated into the text of this translation]

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